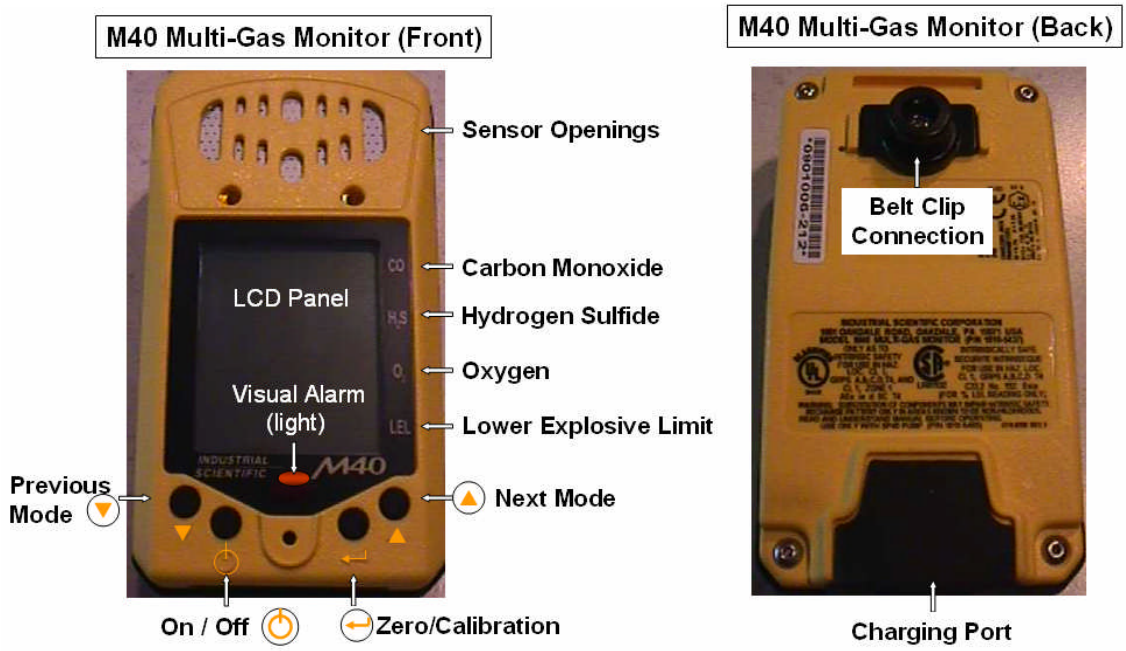
HOW TO USE
THE INDUSTRIAL SCIENTIFIC M-40
MULTI-GAS MONITOR

OPERATION: Atmospheric testing for a confined space is required prior to and during the entry. The M-40 is an electronic portable multi-gas monitor that simultaneously and continuously samples Carbon Monoxide (CO), Hydrogen Sulfide (H_2S), Oxygen (O2) and the Lower Explosive Level (LEL) for combustibles. This monitor can be used by itself and worn using a belt clip. In order to take atmospheric samples in pits or vertical chases, a pump and sampling tube may be attached, which probably will be the standard configuration. A rechargeable internal lithium-ion battery pack powers the monitor and, when attached, the pump. Each of the gas readings are shown in real time on the liquid crystal display (LCD) panel, along with a battery level indicator, low flow (pump) warning, and various icons for different operating modes, as required.



See your Supervisor for Permit Required Confined Space entry.

Call Bernie Lee, Safety, 737-2315, if you have questions about confined space entry procedures or how to use the gas monitors or confined space rescue equipment.

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<u>Turn On</u>:

- To turn the monitor on, press and hold the On/Off button for one (1) second

- The unit will emit a single beep sound and all icons and segments on the LCD panel will light up.

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- The instrument will then self test during a 20 second countdown (20, 19, 18, 17, etc., 2, 1, 0) which is shown on the LCD panel.

- When the countdown is complete the monitor is ready to use and is providing real time readings of the four gases.

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Sampling Pump: The monitor can be used by itself where the immediate ambient atmosphere surrounding the Entrant is tested. However, a pump should be attached when the atmosphere needs to be sampled from a distance, usually from in a pit or vertical chase. A maximum 50 foot sampling hose is available for use with the pump for remote atmospheric testing.

ATTACHING THE PUMP:

- Attach the pump to the monitor by hooking it in the back . . .

- and slipping over the front sensor openings. It is then secured with two screws.

- The pump receives its power from the battery pack when properly attached to the monitor.

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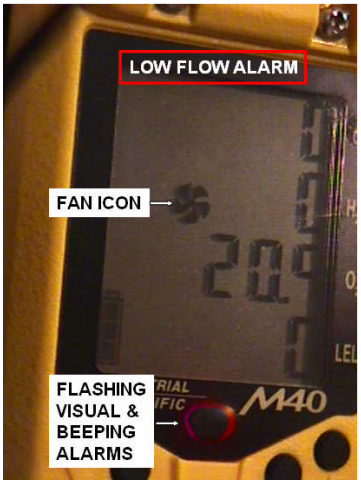
CHECK THE PUMP LOW FLOW ALARM: Before using the monitor with the pump attached, verify the Low Flow Alarm functions by intentionally blocking the pump inlet or attached hose with a finger. A Low Flow Alarm is indicated by a high alarm sound with a flashing visual indicator warning light and a fan icon on the LCD panel. After testing, remove your finger and within seconds the alarms will turn off and the monitor will return to normal operation.



Atmospheric Readings:

Pits and Vertical Chases: The sampling pump must be attached to the monitor in order to take atmospheric readings from pit and vertical chase confined spaces. Some gases are heavier than air so will sink to the bottom of the confined space while other gases are lighter than air so will rise to the top. Atmospheric readings are necessary at different depths to try to detect gases wherever they may be.

a. **TOP**: If possible, place the sampling end of the pump hose through a crack at the entrance to the confined space so as to get as true of a reading as possible. Opening the cover fully may dilute the internal atmosphere to the point where an alarm may not sound until the Entrant is already inside the confined space.

   NOTE: It will take about 1 second for every 2 feet of hose length to get an accurate reading. Example: If the hose is 10 feet long, leave the hose in place for at least 5 seconds to get a good atmospheric reading.

b. **MIDDLE**: Drop the hose about half way down to take another reading.
c. **BOTTOM**: Drop the hose to its full length or depth of confined space and take another reading. If the depth of the confined space is greater than the hose length, the Entrant will have to take the detector inside the confined space to take further readings letting the extended hose lead the descent.

Tunnels and Horizontal Chases: Having the pump attached to the monitor is optional to take atmospheric readings from tunnel and other horizontal chase confined spaces.

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HOW TO USE
THE INDUSTRIAL SCIENTIFIC M-40 MULTI-GAS MONITOR

MAINTENANCE: Report any maintenance problems with a gas monitor to Kurt Patrick, Facilities Management, Building Maintenance.

Cleaning: When necessary, remove debris and dirt by wiping the outside of the monitor with a soft, clean cloth and soft brush. Never use cleaning solutions or solvents on the monitor or pump.

Charging:

- To charge the internal battery, lift out the rubber flap on the bottom rear of the unit. Insert the charger into the charger port by aligning the arrow on the charging plug with the arrow on the unit.

- A full charge takes about 5 hours which should allow the monitor to operate for approximately 18 hours (or 12 hours with the pump attached).

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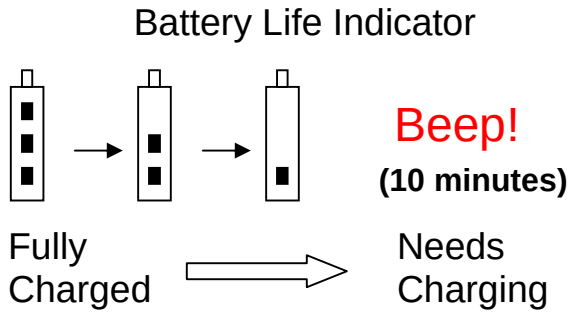
WARNING: ALARM = EVACUATE CONFINED SPACE

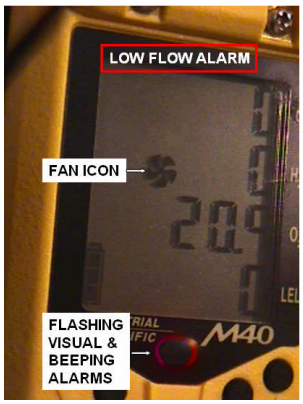
Entrants are to evacuate the confined space immediately whenever the monitor sounds an alarm. The Entrant is to evacuate even if the alarm goes off and the monitor returns to normal readings. Once outside of the confined space and while in a safe environment, determine why the alarm sounded and do not re-enter the confined space until all conditions have again been made safe. This may require coordination with your supervisor and, if the problem cannot be resolved, can terminate entry by Facilities Management and require trained and specially equipped contractors to complete the job.

BATTERY LOW ALARM: A fully charged battery will provide about 18 hours of normal operation (12 hours with pump attached). As the battery is used, the battery life indicator will decrease (from 3 bars to 2 bars to 1 bar). When there are about 10 minutes of battery life remaining, a periodic warning tone will be sounded.



- Evacuate the confined space (even if the alarm goes off and the monitor returns to normal readings)
- Stay out of the confined space until the battery is re-charged or another charged monitor is obtained

PUMP (LOW FLOW / FAN BLOCKED) ALARM: If the sampling line or port becomes obstructed with dust, water or debris, the instrument will give a low flow alarm.



- Evacuate the confined space (even if the alarm goes off and the monitor returns to normal readings)

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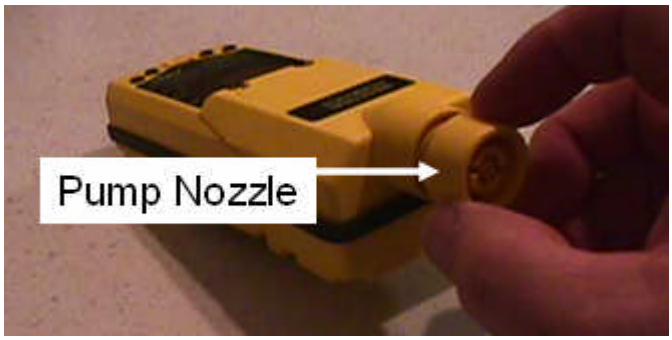
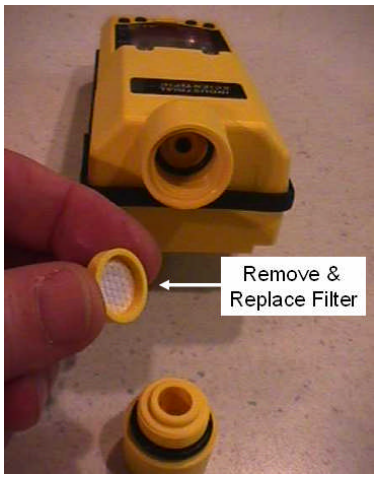
- Inspect the sampling hose and remove visible dust, water and debris
- If the monitor stays in alarm, the internal dust/water filter should be replaced.
    - Turn Off the instrument.
    - Remove (unscrew) the end nozzle from the pump.



    - Remove and replace the filter.



    - Replace (screw) the end nozzle back onto the pump.
- Restart the monitor.

GAS SENSOR ALARM: If any one of the four gas concentrations being sampled exceeds a preset high or low alarm limit, the instrument will go into alarm – the audible alarm will beep, the visual alarm light will flash, and the unit will vibrate for as long as the concentration is out of limits.

- Evacuate the confined space (even if the alarm goes off and the monitor returns to normal readings)
- When the gas concentration returns to normal the alarms should stop.
- If there is a continuous high alarm, this is an LEL over range condition. The monitor must be turned Off and restarted to clear this alarm. Recommend the unit be re-calibrated (by the vendor) after an LEL over range condition.

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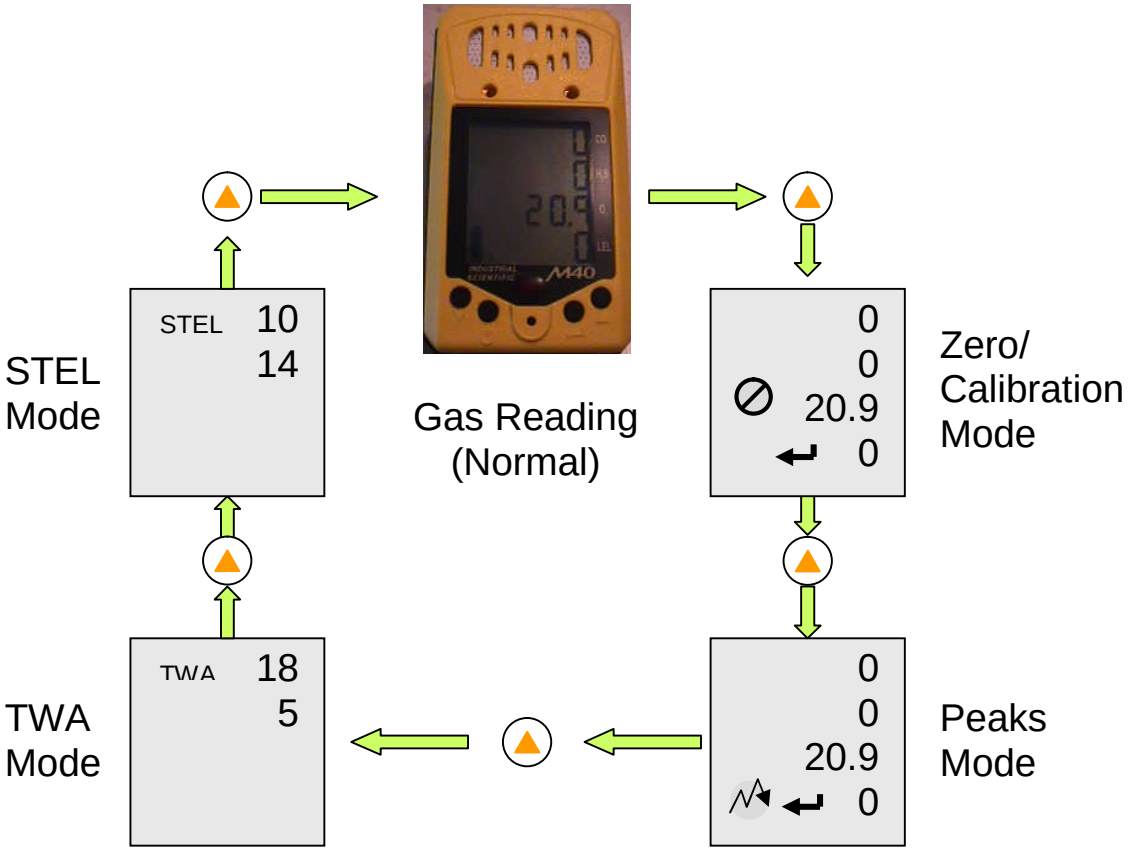
OPERATING MODES: Zeroing, calibration and other information (Peak, TWA & STEL readings) are done by stepping through the various modes by pressing the Next Mode ▲ Key as depicted.

STEP THROUGH THE OPERATING MODES



Calibration ⊘ : The M40 multi-gas monitor requires regular calibration using a cylinder of a specific blend of known gases to perform tests of the sensors and monitor functions. Facilities Management will not perform calibration but has arranged for this to be done by the vendor at least every six (6) months.

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Peak Readings : The readings on the LCD panel are updated continuously. In order to observe the peak readings, you must go to the Peak Mode by:

- Pressing the Next Mode Key once (which goes to the Zero/Calibration Mode; skip this mode)
- Pressing the Next Mode Key a second time takes you to the Peak Mode. The highest readings for the toxic and combustible sensors and the lowest reading for the oxygen sensor will be displayed.
- RESET: To reset the Peak Modes to the current readings, press the Zeroing/Calibration Key.

Time Weighted Average (TWA) Readings: OSHA restricts employees from exceeding the average exposure to gas concentrations measured over an eight (8) hour time period. To view the 8-hour TWA readings for the two toxic (CO & H_2S) sensors:

- Press the Next Mode Key (a third time)
- RESET: To reset the TWA, press the Zeroing/Calibration Key.

Short Term Exposure Limit (STEL) Readings: OSHA has an additional short term exposure limit which restricts employees to a maximum gas concentration within a 15 minute period. To view the most recent STEL values for the two toxic (CO & H_2S) sensors:

- Press the Next Mode Key (a fourth time)
- RESET: To reset the STEL Modes to the current readings, press the Zeroing/Calibration Key.

Configuration: This mode allows the alarm level limits for each of the gases to be changed. This procedure is not described here as preset limits should not be changed. Should any of the sensors be changed to detect different gases, seek the assistance of our vendor and/or refer to the instruction manual in order to set the appropriate limits.

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Turn Off:

- To turn the monitor off press and hold the On/Off button until the unit turns itself off. The unit will display an "H" and will turn off after five (5) beeps (seconds).

Storage: The gas monitors and confined space rescue equipment are kept in the Facilities Management Back Shop Tool Storage Room. See Kurt Patrick of the Building Maintenance Team or your supervisor to check out needed equipment.

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